REMARKS

The Examiner is thanked for the thorough examination of the application. The specification has been amended to correct minor errors and to add enumeration. No new matter is believed to be added to the application by this Amendment.

Status Of The Claims

Claims 1-4 and 6-21 are pending in the application. Claims 7-19 have been withdrawn from consideration by the Examiner. Claim 5 has been cancelled and its subject matter has been incorporated into claim 1. Claims 20 and 21 correspond to claims 14 and 19, respectively.

Objection To The Drawings

The Examiner objects to Figure 1 as not bearing a legend to identify its provenance. Figure 1 has been amended to bear the legend "Conventional Art" so as to correspond to the discussion at paragraph [0009] of the specification.

The applicant additionally respectfully notes that no admission of prior art has been made in the application. An applicant's disclosure cannot be used as prior art absent an admission of prior art. *See, e.g., Riverwood International Corp. v. R.A. Jones & Co., Inc.*, 324 F.3d 1346, 66 USPQ2d 1331 (Fed. Cir. 2003).

Objection To The Specification

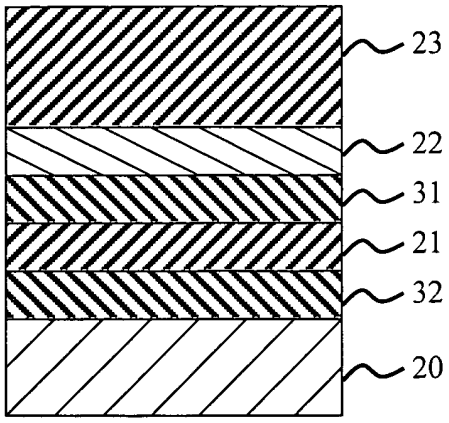
The Examiner objects to paragraph [0015] as containing a typographical error. Paragraph [0015] has been amended to remove the typographical error.

Rejections Based On Shibata

Claims 1-3 and 6 are rejected under 35 U.S.C. §102(b) as being anticipated by Shibata (U.S. Publication No. 2002/0125491). Claim 4 and Claim 5 (now incorporated into claim 1) are rejected under 35 U.S.C. §103(a) as being obvious over Shibata in view of Sone (U.S. Publication No. 2002/0192373). Applicant traverses.

The Present Invention And Its Advantages

The present invention pertains to a nitride semiconductor that has improved electrical and crystalline characteristics. The structure of one of the embodiments of the present invention is shown in Figure 4, which is reproduced below.



Over a sapphire substrate 20 is formed a buffer layer 21 that includes aluminum. A bivalent nitride buffer layer 22 is formed over the nitride buffer layer 21. A nitride buffer laye 31 that does not include aluminum is formed between the bivalent nitride buffer layer 22 and the nitride buffer layer that includes aluminum 21. An additional nitride film 32 can be formed between the sapphire substrate 20 and the nitride buffer layer that includes aluminum 21. A nitride semiconductor 23 is grown over the bivalent nitride buffer layer 22.

Although the present invention has many embodiments, a typical embodiment may be found in claim 1:

> 1. A nitride-semiconductor comprising:
> a metal oxide layer,
> a first nitride layer which includes said metal, formed on said metal oxide layer,
> a second nitride buffer layer formed over said first nitride buffer layer,
> a third nitride buffer layer which does not include said metal, said third nitride buffer layer being formed between said first nitride buffer layer and said second nitride buffer, and
> a nitride layer formed over said nitride buffer layers.

Distinction Of The Invention Over Shibata And Sone

Shibata pertains to a semiconductor element . Figure 1 of Shivbata shows a light emitting element 10 that includes a substrate 1 on which is

formed a nitride underlayer that includes aluminum. On the underlayer 2 is formed a buffer layer 3 that may have the composition $Al_pGa_qIn_{1-p-q}N$ (see paragraph [0032] of Shibata). On the buffer layer 3 is formed a semiconductor layer group 4 that is composed of a GaN based semiconductor that can include aluminum (paragraph [0038] of Shibata).

At page 5 of the Office Action, the Examiner admits to the failings of Shibata. Shibata fails to disclose a second nitride buffer layer that is a bivalent nitride layer (claim 4 of the present invention). Sibata additionally fails to disclose a third nitride buffer layer that does not include metal (claim 5 of the present invention, now incorporated into claim 1).

The Examiner then turns to Sone and asserts that paragraphs [0019] and [0020] of this reference a third nitride buffer layer 13 that does not include metal is formed between a first nitride buffer layer 12 and a second nitride buffer 14. However, these passages from Sone (reproduced below) fail to disclose or suggest an interstitial nitride buffer layer that does not include metal.

> [0019] In the method for growing a high quality group-III nitride film by an MOCVD according to the present invention, a close spaced showerhead type reactor is used, First, an AlGaN buffer layer 12 having a thickness of 20 to 30 nm is grown on a sapphire substrate 11 at a relatively low temperature of 400 to 600° C., and then the temperature of the reactor is raised to approximately 1000° C. while varying the pressure of the crystal growth in the range of 150 to 400 Torr, so that a ***first group-III nitride film 13*** having a thickness of greater than or equal to 0.5 μm (step 1), is grown.

> [0020] Next, after growing the ***first group-III nitride film 13*** the pressure of the reactor is lowered to 50 to 150 Torr without supplying source gases while maintaining the temperature of the reactor at approximately 1000° C., so that a second group-III nitride film 14 is formed (step 2). Here, the composition ratio of the AlGaN buffer layer 12 is $Al_xGa_{1-x}N$ ($0 \leq x \leq 1$). (Emphases added)

That is, although Sone may teach a group II nitride film, nowhere does Sone teach or suggest that the group III nitride film is free from metal. As a result, the combination of Shibata and Sone fails to teach or suggest each and every element of claim 1 of the present invention. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka,* 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

Therefore, the combination of Shibata and Sone would fail to motivate one having ordinary skill in the art to produce claim 1 of the present invention. A *prima facie* case of obviousness has thus nor been made. Claims depending upon claim 1 are patentable for at least the above reasons.

Further, even if one assumes arguendo that the combinantion of Shibata and Sone is sufficient to allege *prima facie* obviousness, this obviousness would be rebutted by the unexpected results of the invention. These unexpected results are discussed at page 8 of the specification in paragraphs

[0039] to [0043]. The invention has an improved FWHM (Full-Width Half-Maximum) of 10-15% as compared to a single buffer layer. The carrier mobility is increased, and the carrier density is decreased. The improved crystalline and electrical characteristics of the invention are thus clear.

These rejections are overcome and withdrawal thereof is respectfully requested.

Foreign Priority

The Examiner has acknowledged foreign priority and indicated that certified copies of the priority documents have been received in the Office Action mailed May 26, 2005.

Conclusion

All of the Examiner's rejections have been overcome, obviated or rendered moot. No issues remain. The Examiner is accordingly respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in

connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: September 26, 2005

Respectfully submitted,

By _____

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Attachments: Replacement Drawing – 1 Sheet